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EXAMINER

GEBREMARIAM, SAMUEL A

ART UNIT PAPER NUMBER

2811

DATE MAILED: 02/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/623,965

Applicant(s)

MA ET AL

Examiner

Samuel A. Gebremariam

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 14-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 14-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Objections***

1. Claims 23 and 24 are objected to because of the following informalities:

Claim 23 recites the limitation "the active surface" in line 5. There is insufficient antecedent basis for this limitation in the claim.

Claim 24 recites the limitation of "embedding the MEMS device in the conveyance". It is not clear if the limitation of the MEMS device refers to the detached MEMS device or another MEMS structure.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 14-15 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung, US patent No. 5,504,026 in view of Khuri-Yakub et al. US patent No. 6,430,109.

Regarding claim 14, Kung teaches (figs. 1-7) a process of forming a micro electromechanical (MEMS, 48) package (encapsulation) comprising: providing a semiconductor device (10) including an active surface (top surface of 10); providing a conveyance (54) with at least one embedded MEMS device (48) disposed therein; and supporting the conveyance over the active surface (fig. 7).

However Kung does not explicitly state that the conveyance is supported using a plurality of electrical contacts in a contact array, wherein the at least one embedded MEMS device communicates electrically to the semiconductor device via at least one of the contacts in the contact array.

Khuri-Yakub teaches (col. 2, lines 31-67 and figs. 1, 2 and 3.8) where a capacitive micro-machined ultrasonic transducer (which is a MEMS structure) comprising a wafer (16) and a conductive polysilicon (21) that is supported using electrical contact array (42), wherein the MEMS structure communicates (the structure comprising 12 is electrically communicates to a semiconductor device (41) via the contacts 42 in the contact array) electrically to the semiconductor device (41) via at least one of the contacts (42) in the contact array (refer to fig. 3.8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the contact array that is used to communicate the MEMS structure with the semiconductor device as taught by Khuri-Yakub in the structure of Kung in order to form better contacts.

Regarding claim 15, Kung teaches substantially the entire claimed structure of claim 14 above including the at least one embedded MEMS device is a capacitor (col. 2, lines 31-33).

Regarding claim 19, Kung teaches substantially the entire claimed structure of claim 14 above including forming an integrated package comprising the semiconductor device and the conveyance.

Regarding claim 20, the combined process of Kung and Khuri-Yakub teaches substantially the entire claimed structure of claim 14 above including forming an integrated package comprising the semiconductor device (10), the conveyance (54), and at least one detached MEMS device (refer to element 12 of Khuri-Yakub structure fig. 3.8) in a first structure, wherein the at least one detached MEMS device is accommodated upon the semiconductor device (41, fig. 3.8).

4. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung, Khuri-Yakub and in view of Lin et al., US patent No. 6,436,853.

Regarding claim 16, Kung teaches substantially the entire claimed structure of claim 14 above except explicitly stating that wherein the conveyance comprises a via disposed therein, the process further comprising: providing at least one detached MEMS device in a first structure; and accommodating the at least one detached MEMS device through the via, upon the active surface.

Lin teaches (figs. 11a and 11b) conveyance (isolation structure on both sides of the MEMS Device) comprises a via (opening between the two isolation structures) disposed therein, the process further comprising: providing at least one detached MEMS (MEMS Device) device in a first structure; and accommodating the at least one detached MEMS device through the via, upon the active surface (top surface of the Si substrate).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the process of the conveyance comprising a via and accommodating the at least one detached MEMS device through the via, upon the

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active surface as taught by Lin the process of Kung in order integrate more than one MEMS device on a single substrate.

Regarding claim 17, Kung teaches substantially the entire claimed structure of claim 14 above except explicitly stating that the conveyance comprises a via disposed therein, the process further comprising: providing at least one detached MEMS device in a first structure; placing the at least one detached MEMS device on the semiconductor device, and accommodating the at least one detached MEMS device through the via, upon the active surface.

Lin teaches (figs. 11a and 11b) conveyance (isolation structure on both sides of the MEMS Device) comprises a via (opening between the two isolation structures) disposed therein, the process further comprising: providing at least one detached MEMS (MEMS Device) device in a first structure; and placing the at least one detached MEMS device through the via, upon the active surface (top surface of the Si substrate); and accommodating the at least one detached MEMS (MEMS device) device through the via (through the opening between the isolation layer), upon the active surface (top surface of the Si substrate).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the process of the conveyance comprising a via and accommodating the at least one detached MEMS device through the via, upon the active surface as taught by Lin the process of Kung in order integrate more than one MEMS device on a single substrate.

Regarding claim 18, Kung teaches substantially the entire claimed structure of claim 14 above except explicitly stating that the conveyance comprises a via disposed therein, the process further comprising: providing at least one detached MEMS device in a first structure; accommodating the at least one detached MEMS device upon the active surface; providing a sealing structure; and disposing the sealing structure in a manner sufficient to isolate at least one of the at least one detached MEMS device.

Lin teaches (figs. 11a-11-b) a conveyance (isolation structure on both sides of the MEMS Device) comprising a via (opening between the isolation structure) disposed therein, the process further comprising: providing at least one detached MEMS (MEMS device) device in a first structure; accommodating the at least one detached MEMS device upon the active surface (top surface of Si substrate); providing a sealing structure a sealing structure (microheater/insulation, figs. 10f and 11b); and disposing the sealing structure in a manner sufficient to isolate at least one of the at least one detached MEMS device (refer to fig. 11b and col. 13, lines 15-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate providing the at least one detached MEMS device in a first structure; accommodating the at least one detached MEMS device upon the active surface; providing a sealing structure; and disposing the sealing structure in a manner sufficient to isolate at least one of the at least one detached MEMS device as taught by Lin in the process of Kung in order to provide a MEMS device that is well protected.

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5. Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung, Khuri-Yakub and in view of Orcutt et al., US patent No. 6,452,238.

Regarding claim 21, Kung teaches substantially the entire claimed structure of claim 14 above except explicitly stating encapsulating the detached MEMS device and the conveyance to form an integrated package.

Orcutt teaches (figs. 4a and 4b) where a MEMS structure (401) is encapsulated to form an integrated package (col. 5, lines 32-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the process of encapsulating the MEMS structure taught by Orcutt in the process of Kung in order to form a MEMS device that is well protected.

Regarding claim 22, the combined process of Kung, Khuri-Yakub and Orcutt teaches substantially the entire claimed structure of claim 14 above including encapsulating the semiconductor device to form an integrated package, wherein the at least one detached MEMS (MEMS 401 of Orcutt is considered to be a detached MEMS structure) device is accommodated upon the semiconductor device (structure 10 of Kung).

6. Claims 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. US patent No. 6,436,853, Khuri-Yakub and in view of Orcutt.

Regarding claim 23, Lin teaches (figs. 11a and 11b) a process comprising: providing a semiconductor device (Si substrate), accommodating a detached micro electromechanical structure (MEMS, MEMS device, fig 11a) device upon the



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semiconductor device; supporting a conveyance (isolation layer on the substrate) over the active surface (upper surface of the Si substrate), wherein the conveyance (isolation layer on the substrate) surrounds the detached MEMS device

Lin does not explicitly teach that the conveyance is supported using a plurality of electrical contacts in a contact array and the detached MEMS device communicates electrically to the semiconductor device via at least one of the contacts in the contact array; or contacting encapsulation material with at least one of the semiconductor device, the detached MEMS device, and the conveyance to form an integrated MEMS package.

Khuri-Yakub teaches a capacitive micro-machined ultrasonic transducer (which is a MEMS structure) comprising a wafer (16) and a conductive polysilicon (21) that is supported using electrical contact array (42), wherein the MEMS structure communicates (the structure comprising 12 is electrically communicates to a semiconductor device (41) via the contacts 42 in the contact array) electrically to the semiconductor device (41) via at least one of the contacts (42) in the contact array (refer to fig. 3.8).

Furthermore Orcutt teaches (figs. 4a and 4b) where a MEMS structure (401) is encapsulated to form an integrated MEMS package (col. 5, lines 32-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the contact array that is used to communicate the MEMS structure with the semiconductor device as taught by Khuri-Yakub in the process of Lin in order to form better contacts.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the process of encapsulating the MEMS structure taught by Orcutt in the process of the combined process of Lin and Khuri-Yakub in order to form a MEMS device that is well protected.

Regarding claim 25, Lin teaches substantially the entire claimed process of claim 23 above including providing a sealing structure (microheater/insulation, figs. 10f and 11b); and interposing the sealing structure upon the semiconductor device (Si substrate) in a manner sufficient to isolate at least one of the at least one detached MEMS device (refer to fig. 11b and col. 13, lines 15-25).

7. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin, Khuri-Yakub, Orcutt and in view of Kung.

Lin teaches substantially the entire claimed process of claim 23 above except explicitly stating that embedding the MEMS device in the conveyance.

It is conventional and also taught by Kung (col. 4, lines 62-67 and col. 5, lines 1-12), where the MEMS structure (48) is an embedded MEMS device (fig. 7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the process of embedding the MEMS device taught by Kung in the process Lin in order to protect the MEMS device before it's released.

### ***Response to Arguments***

8. Applicant's arguments with respect to claims 14-25 have been considered but are moot in view of the new ground(s) of rejection.

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**Conclusion**

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Gebremariam whose telephone number is (571) 272-1653. The examiner can normally be reached on 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAG  
January 26, 2006



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